DOCUMENT RESUME

ED 021 292 24 CG 002 690

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ANTECEDENTS AND CONSEQUENCES OF INTUITIVE THINKING. FINAL REPORT.

Vassar Coll., Poughkeepsie, N.Y.

Spons Agency- Office of Education (DHEW), Washington, D.C. Bureau of Research.

Bureau No- BR-5-0735

Pub Date Jun 68

Contract- OEC-3-10-072

Note- 68p.

EDRS Price MF-$0.50 HC-$2.80

Descriptors- *COGNITIVE PROCESSES, INTERVIEWS, *PERCEPTION, PERSONALITY, *PROBLEM SOLVING, PSYCHOLOGY, THOUGHT PROCESSES

Identifiers- Myers Briggs Type Indicator, Strong Vocational Interest Blank

The history and evolution of the concept of intuition is traced through philosophical intuitionism and positivism to contemporary psychology. The theoretical and empirical psychological research relating to intuitive experience and intuitive behavior is also traced, and relations between intuitive problem solving and previous data concerning individual differences and stability of individual differences in this propensity are reviewed. Data are presented concerning the relationships between concurrent preferences appraised by the Strong Vocational Interest Blank and the Myers-Briggs Type Indicator and individual tendencies to solve problems accurately or inaccurately on large or small amounts of information. Interview studies are reported which compare the behavior and experience of individuals who show large increases in intuitive thinking with those who show large decreases. Interview data with extreme performers are reported concerning their thinking processes, and questionnaire study is presented appraising the post-college experience of individuals who showed various approaches to an intuitive problem solving task while in college. Relationships between the present findings and earlier findings are discussed and several lines of further research are suggested. (Author)

BR-5-0735
PA-24

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U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

CG 002 690
ED021292

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The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

Vassar College

Poughkeepsie, New York

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INTRODUCTION

The problem studied in this project was the theoretical concept of intuition and the behavioral phenomenon of intuitive problem solving. The study progressed from several points of view. First, the historical context of the concern with the concept of intuition was explored with reference to philosophy, psychology, and mathematics. Second, with focus on the field of psychology, the theoretical and empirical analyses which have been brought to bear on intuitive behavior were explored. Third, the measurement of intuitive problem solving with reliance on quantifiable and repeatable behavioral measurement was developed. Fourth, intellectual and personality correlates of intuitive problem solving were studied.

The majority of the findings of this project have already been published (Westcott, 1964, 1966, 1968; Westcott and Ranzoni, 1963; Westcott and Tolchin, 1966, 1968), and the present document is to be understood as providing two things: 1) a summary of the work already published, and 2) an addendum comprising previously unpublished material. The reader should make extensive reference to the Principal Investigator's major publication on the subject (Westcott, 1968), copies of which have been submitted with this report.

HISTORICAL BACKGROUND

Intuition has a very long history within the discipline of philosophy and a rather shorter one in psychology. Since Plato, intuition has been considered a way of knowing which is fundamentally different from that with which we are most familiar. For Plato, Spinoza, Locke, Hume, Bergson, Croce--and for others, as well--intuition is a non-sensory way to the attainment of permanent, abiding, universal, ultimate truth or reality. Through intuition, one might be directly in contact with the final truths of the universe, the fundamental certainties of reality, the ultimate nature of life or of God. In their view, the process of intuition is adamantly outside the normal conduct of daily life, and reason--as we generally know it--is entirely antagonistic to the operation of intuition. Truth which could be attained through intuition could never be attained through reason, and intuited truth is a higher truth than that ever attained through reason.

This extreme position, called "philosophical intuitionism" places intuition entirely separate from reason, antagonistic to it, and leads to knowledge of realities different from those which can be known through the senses and reason. We begin at this point because it is from here that compromises and criticisms stem, and it is from here that the current conceptions of intuition derive.

One of the most provocative and influential views within this tradition of philosophical intuitionism is offered by Bergson. He asserted that the fundamental truth and reality of the universe is change, evolution, along a definite but unpredictable course. Man, in his efforts to adapt to this ever changing reality has evolved intellect as a way of imposing "patterned immobilities" on the continuous flux so that ordinary life is possible. These patterned immobilities are the conventions of communication which we adopt, the fixedness of elements in reality, the permanences we perceive. These patterned immobilities, while making adaptive life possible, also obscure from man the true continuous change and flux of life, which is the prime reality. It is, of course, through intuition that one can regain that which was lost--contact with prime reality.

He goes on to assert that lower organisms, in their instinctive wisdom, are continuously in contact with the flux of life, unencumbered by the patterned immobilities of reason. The lower organisms, however, cannot rise above the action of instinct, while man can. He finds that instinct and reason can enrich each other in man to yield intuition--the highest form of knowing. This form of knowing can reveal previously unknown truth and wisdom, but unfortunately, this is rarely in a form useful to man--or indeed communicable to man. But communicability is not a necessary part of knowledge in the intuitionistic view: intuited knowledge, held by one person, even if obscure and uncommunicable, is of great value.

This intuitionistic point of view obliges us to accept pure subjectivism and personal certainty as adequate criteria of truth along with empirical criteria of truth, and the point of view has come under severe attack from the neopositivistic philosophers.

Several of the criticisms range around the question of contradictory intuitions--either contradictory at one point in time or contradictions of "self-evident truths" by the production of new knowledge. Stocks (1939) and Ewing (1941) have dealt with these objections to the intuitionist position, and have compromised to the extent that the certainty of intuitions is seen as "justifiable belief," and the attainment of such a justifiable belief may be essentially a rapid inference. While these are marked deviations from the notion of intuition as "immediate apprehension of ultimate reality" both of the above writers hold that an element of intuition must exist in any deductive of inductive reasoning process to bind a premise to its conclusion. On the other hand, more severe criticism arises from Bunge (1962), who holds that any point of view which proposes an absolutististic non-rational notion of truth is a "variety of quackery."

Mathematicians hold two notions of intuition as well: the one is a point of view within mathematics which holds that ultimate proofs are self evident proofs, and that no amount of algebraic manipulation can prove a geometrical axiom: its proof must be self-evident. The second point of view is that intuition is a process whereby a mathematician can (and does) select from a host of alternatives that one which proves to be most fruitful. The latter is more familiar to most readers, and Poincare (1913) has spoken eloquently of it as "discernment."

Finally, among psychologists, there are also two points of view and two controversies. The first concerns the understanding of personality, by the direct "intuitionistic" approach as compared with the inferential-probabilistic approach. The former is a derivative of the German academic tradition of philosophy-psychology and is represented in the United States principally by Allport's idiographic approach (1937, 1961). The second is a derivative of the mental testing movement begun about the turn of the century in France and England, and is represented currently in the psychometric approach to the study of personality. While disputes at the methodological level go on, they tend to obscure the underlying metaphysical differences between the two points of view. The idiographic-uniqueness-intuitionistic point of view must be based on the contention that there is a stable unchanging reality to be discovered; the probabilistic-psychometric-nomothetic approach is compatable with a metaphysics which holds that reality is the name given to a more or less successful predictive model which has been constructed.

PSYCHOLOGICAL RESEARCH

In addition to this continuing dispute among psychologists, there is a continuous line of reasoning and research which identifies intuition as a particular form of behavior--as contrasted to a particular form of knowing. This line of research takes the phenomenon as a problem in psychology rather than as a problem in epistemology. This tradition began with Helmholtz, who considered knowledge which was unsupportable by logical demonstration as "unconscious inference." His initial analysis, as early as 1867, was directed to the notion of "immediate awareness" in perception, but it did set the stage for a long tradition of research most adequately typified by the study of the micro-genesis of perception (Flavell and Draguns, 1957; Kragh, 1955).

It appears that the notion of intuition as a pattern of behavior which implies the reaching of accurate conclusions on the basis of what appears to be insufficient or incomplete evidence has been rediscovered or re-introduced independently by not less than a dozen psychologists over the hundred years since Helmholtz first offered the idea.

The "inference" point of view on intuition has generated a variety of psychological studies, and it is to these that we now turn.

Empirical Psychological Studies of Intuition

Empirical psychological studies purporting to be concerned with intuition all share essentially the same theoretical base: intuition is seen to be a behavior or complex of behaviors in which accurate or useful conclusions are reached on the basis of obscure or apparently insufficient evidence. The studies themselves can be divided into several classes, many of which have matured into well established traditions of psychological research which now make little or no reference to the notion of intuition as either part of the problem or as part of the solution.

The first kind of study reported was in the area of interpersonal perception and judgment, in which individuals were required to reach conclusions about personality characteristics of other individuals on the basis of whatever cues were available and utilized in the situation provided. The situations ranged from repeated intimate contact (Adams, 1927) to minimal observation on a very transient basis (Hathaway, 1955). Some of these studies were concerned with differences among the observers, some with general characteristics of interpersonal perception, and some with the characteristics of the observed subjects. All yielded essentially poor results, in that each experimenter concluded that the situation was much more complex than had been expected, and that any demonstration of a single characteristic of "intuition" seemed to be out of the question. The general findings on interpersonal perception (which make almost no reference to questions of "intuition") are reviewed by several quite recent writers (Bruner and Taiguri, 1954; Taft, 1955; Cline, 1964).

Another interpersonal approach has been the study of clinicians in action, that is, the judgment of personality by professionals. While study of this kind has a clear relevance to the methodological and philosophical dispute about intuition vs. inference as a way of understanding personality, few of the data have ever found their way into the theoretical dispute. One particularly interesting series of studies of the judgment of personality by a professional was presented by Berne (1949, 1953, 1955, 1962). He describes in some great detail the fact of his successful judgments, and then proceeds to analyze the processes involved in making these judgments. He develops both the empirical basis of his judgments and the theoretical setting for them. While Berne indicates that skill in carrying out "intuitive" judgments is probably the product of long experience with informal judgment in combination with a particular set of personality characteristics on the part of the judge, Oskamp (1962) has shown that increases in skill and appropriateness of judgment can be altered rapidly among clinicians by means of a relatively modest training program.

Another study which is an extension of interpersonal judgment was carried out by Hebb (1946). His concern was with the judgment of emotional states in chimpanzees as carried out by experienced handlers. He defined intuition in terms of implicit inference, and he found that the bases on which the successful (i.e. adaptive) judgments were made were not necessarily the bases which the judges claimed to be using.

Thus, there is a tradition--although a rather spotty one--which has been consistently concerned with intuition as a process of inferential judgment, usually implicit, often said to be unconscious, and generally directed at the problem of judging other animate objects, usually other persons.

A second line of research on intuition has concerned problem solving, i.e., the reaching of accurate conclusions on the basis of global unanalytical processes or implicit inference. This line of research was initiated in the first ten years of the present century and was based on the notion that more primitive, less socialized, less intelligent individuals would utilize the more primitive intuitive basis for reaching conclusions. Studies of retarded children (DeSanctis, 1928) were said to show that younger and retarded children were more able to make accurate wholistic judgments of the number of dots on a card than were older normal children or adults. The data in these studies are not very convincing and there is a long gap in time before another study intuitive of problem solving was carried out. Bouthilet (1948) had subjects read a list of associates constructed with certain fixed but unexpressed rules concerning the relation between the stimulus word and the response word. They were then obliged to pick out the pairs they had seen from a much longer list as a test. The test list was constructed so that only half of the original list was included and some unfamiliar pairs, constructed according to the rule, were also included. She measured the extent to which Ss checked unfamiliar pairs which followed the rule as being familiar pairs. She was also concerned with the ability of Ss to verbalize the rule. The definition of intuition which she followed was the "ability to make correct guesses without knowing why," and the task was designed to reveal the extent to which individuals could do just this.

In the same vein, Crutchfield (1960) studied the effect on spatial mechanical problem solving which could be induced by Ss having had relevant or irrelevant prior experience with spatial-mechanical puzzles. He found that male Ss who had had prior experience were better on the test problems than male Ss who had not had such experience, although the superior Ss could not say what the prior experience had helped them with. On the contrary, the prior experience was no help to female Ss. It might be pointed out here that no study attempting to explore male-female differences in "intuitiveness" has ever convincingly shown females to be superior to males despite folk-psychology to the contrary. Most studies show no differences at all.

The present author's work on intuitive problem solving is in this tradition as well. From a conception of intuition as the process of reaching accurate conclusions on the basis of consensually inadequate information, a series of studies were performed to explore individual differences and the stability of individual differences. The procedures may be summarized briefly as follows: Ss are given problems to solve which are in the form of verbal and numerical series and analogy problems. Relevant information is made available in small amounts in a fixed sequence, and Ss are asked to solve as many problems as possible correctly using as little information as possible. Subjects, in repeated samples, differentiate stably along the dimension of how much information they require before they are willing to attempt solutions to problems and along the dimension of success in problem solutions. Consistently, these two dimensions are uncorrelated, so it is possible to identify individuals of the following extreme types: 1) those who consistently solve many problems correctly on little information; 2) those who consistently require little information but are typically unsuccessful; 3) those who require excessive information and are ordinarily accurate; 4) finally, those who require a great deal of information but are usually inaccurate in their conclusions (Westcott, 1961).

This same conception of intuition, as the process of reaching accurate conclusions on the basis of less explicit information than is ordinarily required for reaching those conclusions has been the basis for a perceptual task suitable for use with children (Westcott and Tolchin, 1966, 1968). Here again, stable individual differences have been found.

It is the rare piece of research which focuses on individual differences in intuitive thinking, but such differences are often alluded to in the literature. The present author's work has been concerned specifically with these, and it is possible to conclude that they exist, they are measurable, and they are relatively stable over time.

Psychological Theory in the Study of Intuition

There are indications in the preceding brief summary of empirical efforts that the theoretical considerations of a variety of sophisticated areas of psychological research are relevant to the psychological analysis of intuition as a behavior pattern. It may be pointed out that no set of psychological constructs has been found useful in the analysis of individualized subjective altered experience as described with respect to "philosophical intuitionism." That is, the kind of phenomenon dealt with by the philosophical intuitionists is not amenable to contemporary psychological analysis: it is unrelated to ordinary empirical knowledge; it is said to be contact with a reality ordinarily unknown to man; it is incommunicable; it is antithetical to the knowledge of reason. On the other hand, the behavior which we have described as intuitive--the consistent "good guess," the solving of problems on the basis of insufficient explicit information, the reaching of accurate conclusions without knowing the exact basis for them--these are all behavioral events which are, in principle, at least, open to psychological analysis.

The general areas in which one might seek relevant psychological constructs for this analysis would be those areas in which Ss are expected to carry out ordinary psychological functions--learning, perception, problem solving, judgments, and so on--under conditions which are in some way deprived of explicit information.

We turn to the problem of behavior without awareness, reviewed and analyzed critically by Adams (1957) and by Erickson (1962). The general conclusion to be reached with respect to this area is that there are certain functions which seem to be demonstrable in the absence of verbalization by the S of the rules governing the behavior, or without verbal report of the cues employed. It appears further that accuracy without verbalization is more likely to occur under complex conditions or under conditions in which partially correlated hypotheses are possible. Both Adams and Erickson conclude that behavior without awareness is less common (at least in the laboratory) than many people seem to think, but neither is willing to rule it out as a phenomenon which happens at least some times. It is of interest that studies of learning without awareness rarely have attended to individual differences, and even when these were evident enough to be pointed out, they were not followed up.

In the area of subliminal stimulation and incidental learning, many of the same problems are present: is any effective stimulus really subliminal? or is it simply a matter of subjects failing to report events because of their vagueness? Gaito (1964) has studied the information transmission qualities of subliminal stimuli and the entire tradition of research on the microgenesis of perception (Flavell and Draguns, 1957; Kragh, 1955) testifies to the fact that there is information transmitted before full recognition and identification is possible. Furthermore, the information transmitted "subliminally" may be sufficient for some individuals to reach conclusions. Indeed the entire notion of sensory thresholds is an arbitrary one, and a stimulus which carries information for one subject may not carry information for another--whether subliminal or not. Eagle (1962) has shown individual differences in sensitivity to subliminal stimulation, and has indicated that individuals most sensitive to subliminal stimulation have consistent personality characteristics, while there are also situational variables which contribute to more or less influence from subliminal stimulation. Similarly, Allison (1963) has shown this effect in the area of incidental learning: the experimental conditions imposed on the subject can produce more or less effect from incidental cues.

Blatt (1961) studied differences between efficient and inefficient problem solvers in the extent to which their problem solving behaviors--particularly critical changes in behavior--were accompanied by changes in autonomic activity. He found striking differences, in that efficient problem-solvers displayed cardiac changes associated with these critical points in the problem solving process, while inefficient problem solvers did not. Similarly, Hess (1965) has reported autonomically mediated alterations of pupil size under various conditions of the arousal of interest. These kinds of findings together point to the possibility that while generally unreported, subtle vegetative changes may serve as cues to alterations of behavior under conditions where the usual external cues are minimal, obscure, or absent.

Thus, it appears that many well-developed areas of psychological concern are focussed on problems of complex human functioning under conditions which can reasonably be called "information-deprived," and it is suggested that the achievement of accurate, successful or productive behavior under these conditions is what has been referred to by psychologists--and the more contemporary philosophers--as intuition or intuitive behavior.

This background and these findings lead to the highly probable conclusion that there is a complex psychological function--or a group of functions--which can be properly called intuition, and that this function is explicable in terms of psychological concepts and findings which have quite sophisticated status in psychological theory.

The historical and theoretical developments described above are treated in detail elsewhere by the present author (Westcott, 1968), as are a variety of empirical findings derived from the study of individual differences in the propensity for solving problems under conditions of information deprivation. The methodology for this study has also been presented elsewhere (Westcott, 1961, 1962, 1968; Westcott and Tolchin, 1966, 1968) but a brief review of both the methods and findings is in order to set the stage for the data presentation which represents the bulk of this report.

In general, the method for the study of intuitive thinking involves the presentation of problems for which solutions can be sought through the accumulation of relevant information. Subjects are given the information, at their option, and are requested to solve the problems correctly using as little information as possible.

For adults, the problems are verbal and numerical series and analogies; for children the problems involve identification of the content of a line drawing which is presented in a sequence of fragmented steps, each step more complete than the one before it. In the case of both children and adults, the subject is to reach an accurate conclusion on the basis of minimal information.

In addition to the study of individual and age-related differences in performance on tasks such as these, a wide variety of intellectual academic, personality and attitude correlates have been explored and reported elsewhere (Westcott and Ranzoni, 1963; Westcott, 1968). A brief summary of these results is in order before we proceed.

The previously reported results can be divided into several classes as follows: 1) the basic measurement of intuitive thinking; 2) stability of intuitive thinking; 3) age differences in intuitive thinking; 4) correlates of intuitive thinking. These are each summarized below.

1. Basic measurement of intuitive thinking. In all, 11 samples of Ss of college age have been studied on the problem solving scale (Cf. Westcott, 1968, chapter 5) and 17 samples of Ss ranging from nursery school through college have been studied on the perceptual inference scale (Cf. Westcott and Tolchin, 1966, 1968; Westcott, 1968, chapter 6). In all samples, Ss can be differentiated along the two principal dimensions of interest--Information Demand and Success. The distributions of scores on these tasks in comparable samples are similar for different forms of the task, and nearly identical for the same form of the task.

On the intuitive problem solving task, the two principal dimensions of behavior are uncorrelated, and it is possible to identify extreme performers on both dimensions at once. Ss have been identified who require significantly less information than the mean and are significantly more successful than the mean, and these Ss are designated Group 1, intuitive thinkers. A second group can be identified who are significantly low on Information Demand, but are also significantly low on Success. These are identified as Group 2, wild guessers. A third group is significantly high on Information Demand and significantly high on Success. These are designated Group 3, careful successes. A final group is found who are significantly high on Information Demand, but significantly low on Success. These are Group 4, the careful failures. In all, about 7 percent of Ss meet the criterion for membership in each of these groups (Cf. Westcott, 1968, Table 5-8).

In the study of Perceptual Inference, the independence of Information Demand and Success was not replicated, and the correlations between these two dimensions are consistently high. Thus, it is not possible to identify the same four kinds of extreme performers as noted above. It is, nonetheless, possible to identify meaningful and stable individual and age-related differences in Perceptual Inference behavior. (Westcott, 1968, chapter 6; Westcott and Tolchin, 1968).

2. Stability of intuitive thinking. The split-half reliabilities of the principal scores on the problem

solving scale are, in general, in the .60s or above, and on the perceptual inference scale they are in the same range. In general, it can be said that the younger children show greater split-half reliabilities of measurement than do the adults. Test-retest reliabilities have been calculated for adults on the problem solving scale over a period of three years, and the results indicate approximately the same reliability as found with the split-half method (Westcott, 1966). For the Perceptual Inference task, a two year test-retest study was conducted with Ss initially tested in grades 5 and 6, and later retested in grades 7 and 8. These reliabilities were also of approximately the same magnitude as the split-half reliabilities (Cf. Westcott and Tolchin, 1968; Westcott, 1968, chapter 6).

3. Age differences in intuitive thinking. Because the problem solving task is not within the competence of Ss below the upper levels of high school, the Perceptual Inference task was used to study age differences in Ss ranging from nursery school through college. In general, it can be said that information demand tends to increase from nursery school to the middle years of elementary school and then to decline again to college age. That is, Ss in the youngest groups are willing to make attempts at solutions on very little information, middle elementary school children are the least willing to do this, and college students fall between the two. Second, the success with which accurate conclusions are reached tends to increase from nursery school to the middle elementary years, then level off briefly, and finally increase to college age. Thus, when these two scores are combined as a ratio of Success to Information Demand, the derivative score--Efficiency--shows a steady rising function of age. (Cf. Westcott, 1968; Westcott and Tolchin, 1968). It is to be concluded then, that intuitive thinking as the process of reaching maximally accurate conclusions on the basis of minimal evidence increases with age.

4. Correlates of intuitive thinking. Among college age Ss, the relations between scores on intuitive thinking and academic measures and attitude-personality measures have been explored. Standardized scales of academic potential or academic success have yielded only minimal relationships to intuitive problem solving skill, and standard personality-attitude scales have performed about the same. However, interview data, adjective check list data, and item-analysis data of

personality scales have shown coherent differentiations among groups of extreme performers on the intuitive problem solving scale (Cf. Westcott and Ranzoni, 1963; Westcott, 1968, pp. 114-147). Among children, relationships between performance on the Perceptual Inference scale, academic measures, and personality measures have indicated no stable relationships of perceptual inference behavior to personality or academic characteristics (Westcott and Tolchin, 1966; Westcott, 1968, p. 171-177).

Thus, the findings already reported indicate a complex of behaviors called intuitive thinking which are coherent within an individual and relatively stable over time, but unrelated to the usual measurements made of academic potential, academic success, or standardized measures of personality characteristics.

THE PRESENT STUDIES

The specific methods for each of the studies to be reported here vary, of course, but the general methodology may be described at this point.

Either the intuitive problem solving scale or the Perceptual Inference task were used to scale individual subjects with reference to a) Information Demand, b) Success, c) Efficiency. Information was then sought with respect to a) biographical information, b)self-appraisals of both cognitive functioning and personality characteristics, c) retrospective evaluation of academic experience, d) performance on standardized personality-attitude-interest scales.

Two general methods were used for comparing the findings on different measures: a) correlational analysis, comparing the performance of all Ss on two or more measurement procedures, b) criterion analysis, in which extreme performers selected on the basis of Information Demand, Success, or Efficiency were compared in a dichotomous fashion with respect to their performances on other variables.

The methodology for the intuitive problem solving scale has been reported in detail elsewhere (Westcott, 1961, 1962, 1968) and the method for the study of Perceptual Inference has also been described elsewhere (Westcott, 1962, 1968; Westcott and Tolchin, 1966, 1968). The correlational analyses and the criterion analyses are methods which have been used through this research project.

Results to be presented here may be divided into three categories: 1) concurrent studies of preference, 2) retrospective and prospective interview studies of cognitive change and educational experience, 3) questionnaire studies of post-college experience. All three kinds of studies are, of course, carried out with reference to individuals who display extreme forms of behavior on the intuitive problem solving scale.

Concurrent Studies of Preference

The concurrent studies of interest and preference among intuitive and non-intuitive thinkers were pursued by means of the well-known Strong Vocational Interest

Blank (Strong, 1945), and the less well-known Myers-Briggs Type indicator (Myers, 1962). The general methodology has been explained with respect to our earlier studies of the characteristics of intuitive problem solvers (Westcott and Ranzoni, 1963; Westcott, 1968) and involves an initial correlational study followed by criterion analysis studies.

Each of the two measuring scales is treated separately below.

Vocational interests of intuitive thinkers.

The Strong Vocational Interest Blank, form M, was administered to 95 female Ss, all college seniors whose performance on the intuitive problem solving scale had been studied both when they were freshmen and when they were seniors. These Ss were drawn from the parent populations VCFr60a and VCFr60b (Cf. Westcott, 1968, Table 5-1). The three-year test-retest reliabilities of the problem solving scores were as follows: Information Demand, r=.50; Success, r=.63; Efficiency, r=.66 (Westcott, 1966). These test-retest reliabilities approximate the split-half reliabilities of the same scores.

From each testing, extreme groups of performances were selected, but because the reliabilities are not perfect, some Ss identified as extreme performers when freshmen were no longer extreme performers when seniors. By the same token, some Ss who were not extreme as freshmen became extreme as seniors. Consequently, two sets of extreme groups were identified, with considerable overlap between them.

The extreme performance groups as freshmen were compared on their SVIB performances as seniors. In this comparison, the groups were of the following sizes: Group 1, intuitive thinkers, N=8; Group 2, wild guessers, N=13; Group 3, careful successes, N=13; Group 4, careful failures, N=14.

Correlational studies revealed no systematic patterns, and the results of a criterion group item-analysis is shown in Tables 1, 2, and 3.* The results may be summarized as follows: Group 1, the intuitive thinkers, show a stated preference significantly higher than do the other groups for the vocations of rancher,

* All tables will be found in the Appendix.

surgeon, musician, manufacturer and stockbroker. They stated no outstanding preferences for particular academic subjects, but significantly disliked philosophy and geology. They revealed a considerable preference for planning for the short-term future (as contrasted to the long-term future), and they unanimously prefer their amusements in small groups or alone--as compared to the other groups preference for larger crowds.

Group 2, the wild guessers, stated significant dislikes for the vocations of music teacher and real estate salesman, but no significant positive preferences. In academic subjects, they like a mathematical cluster significantly more than the other groups do--calculus, algebra, and arithmetic. Also they show greater confidence in their abilities to get others to do what they want than the other groups do (Cf. Westcott, 1968, p. 137).

Group 3, the careful successes, actively prefer the vocations of music teacher and librarian more than the other groups do, and in school subjects they indicate preference above the other groups for geometry and civics. They are more inclined to consider working for someone else (as compared to working for themselves) than the three other groups are, and in this process, they place a high value on considerate treatment from superiors (Cf. Westcott, 1968, p. 140).

Group 4, the cautious failures, show a significant preference for the vocation of clergyman, and a decided dislike for the vocation of politician. They claim to have disliked mathematics and liked nature study in school, and they are less likely to rebel at orders than the other groups.

Before attempting to integrate these findings, we shall present the SVIB analysis for the second sample of extreme performers--those identified from the same parent populations on the second testing, as seniors. In this set of comparisons, Group 1, N=5; Group 2, N=7; Group 3, N=7; Group 4, N=9.

Tables 4 through 8 show the analysis of these extreme performers by vocational clusters, and the rank of each extreme group on each of the sub-scales of each cluster. The rank on the scales is the degree to which the group's interests conform to the interests of successful persons in those vocations. The ranks for all of the sub-scales are included in the ranked Chi-square analysis. The results may be summarized as follows: Group 1 shows the least interest of all the groups in cluster 1--professional practitioner, such as physician, psychologist, etc., but ranks first in interests shown by abstract physical scientists (cluster 2) as well as in the interests of persons engaged in typically masculine manual occupations, such as farmer, carpenter and policeman. They show another low point in the extent to which they share the interests of persons in social service activities.

Group 2 ranks first in interests shared with professional practitioners but otherwise, they tend to share the pattern shown by Group 1--interest in those areas which are of interest to abstract scientists and practical-manual occupations.

Group 3 shares most strongly with the social service cluster and the business cluster, while Group 4 is again distinguished by being relatively undistinguished, except for their lack of interest in areas which are of interest to successful businessmen.

Combining the results of the two analyses above, we may add to our earlier (Westcott, 1968, chapter 5) characterization of the four extreme groups in the following ways:

Group 1 appears to state significantly more preference than the other groups do for a diversity of specific occupations, particularly occupations which involve considerable risk and individual decision-making and rely on one's own resources. They share interests with individuals who are successful in the activities of abstract scientists more closely than do the other groups. Further, they share interests with persons in more typically masculine vocations involving practical manual work. They are least inclined of all the groups to share interests with businessmen and persons successful in social service vocations.

These findings are in keeping with earlier findings which showed an emphasis for Group 1 on abstract thinking, individuality, independence, diversity, and a lack of conformity to usual social expectations or roles for the sake of conformity.

Group 2 may be elaborated with respect to their dislike of the vocations of music teacher and salesman--presumably requiring a certain amount of patience and tact, and their feeling of confidence in regard to the manipulation of other people (Cf. Westcott, 1968, p. 140). Their stated interest in a cluster of numerical academic subjects--calculus, algebra and arithmetic is something of a surprise, in this context, but the fact that they share some of the interests (abstract science and practical-manual) with Group 1 is in keeping with the fact that all of our analyses have shown some overlaps between these first two groups (Westcott and Ranzoni, 1963; Westcott, 1968). They share, most strongly, the interests of individuals in professional service occupations--physician, dentist, and so on, which involve both the sciences and interpersonal manipulation.

Group 3 seems to be quite predictable. They state most strongly of the four groups an interest in the vocations of music teacher and librarian, and a preference for the orderly subject matters of geometry and civics in their school experience. Similarly, they are more inclined to be happy working for others (as compared to working for themselves) and they place a high value on curteous treatment by supervisors. They show little sharing of interest with persons in typically masculine-practical-manual vocations and show the greatest sharing of interests with persons in social services and business occupations. In these respects they are again in the mainstream of well-socialized conventional American values (Cf. Westcott and Ranzoni, 1963).

Group 4 again gives us a meager set of findings, but they add to the coherence of the characterization of the group. They state the strongest preference for the vocation of clergyman and the least preference for the vocation of politician (Cf. Westcott, 1968, p. 147). They also state that they are less likely to rebel at orders than the other groups are, and they show their greatest sharing of interests with successful people in professional services, while they share least with people in business.

The significance of the particular preferences and dislikes which distinguish the groups is not entirely clear, of course, but those described above are quite congruent with the earlier descriptions offered. Again, the intuitive thinkers appear to be individualistic, self reliant, ambitious and willing to take risks; the wild guessers combine a striving for identity with a relatively unhappy nonconformity and uneasy interpersonal relations; the careful cautious successes are in the mainstream and well socialized in their culture; the careful cautious failures dislike risk, prefer certainties and prefer to not rock the boat.

Intuitive thinking and Jungian typologies.

The Myers-Briggs Type Indicator (Myers, 1962) is a paper and pencil attitude-interest-preference scale based on the Jungian typologies (Jung, 1926). It purports to identify in individuals the prominence of the various aspects of personality which make up the Jungian types, comprising four "functions" and two orientations. The four functions are thinking, feeling, sensation, and intuition; the two orientations are introversion and extraversion. One or another of the four functions is theorized to be "superior" in each individual, with one or perhaps two more being available for use, while a fourth is "inferior" for that individual. Similarly, according to theory, a person leans toward introversion or extraversion.

The four functions may be described as follows: Thinking involves judgments of true and false, logical deductions and inferences, cognitions of objective fact; the function of feeling involves judgments of pleasant and unpleasant, acceptance and rejection, assertions of like or dislike. The function of sensation involves no judgments; it perceives sensory details and operates by receiving these and accepting them as truth. Intuition also implies no judgment, for it accepts the perception of the implications of situations and events and objects, and takes them as truth (Westcott, 1968, pp. 32-33). The first two are incompatible, and the second two are incompatible, inasmuch as each pair implies the judging or the perceiving by different and incompatible means. Extraversion implies that an individual takes the outside world as his principal source of stimulation, or the focus of his judgments, while introversion implies the internal world as the focus for information or judgments.

The scoring of the Myers-Briggs Type Indicator items yields a score for each individual on each function, even on the incompatible ones, and the combination of the scores on incompatible functions yields a direction of preference. While the preference scores range toward both poles from zero, they may be transformed to unidirectional scales and thus yield scores which can be correlated with performances on other testing devices.

Scoring also provides for an appraisal of the propensity for judging vs. the propensity for perceiving. The former is a combination of the scores on thinking and feeling while the latter is a combination of the scores on sensation and intuition.

Inasmuch as we noted earlier that some of the characteristics of successful intuitive thinkers resembled Jung's description of the introverted intuitive (Westcott, 1968, chapter 5), it is of interest to determine the relationships among these characteristics when appraised by an instrument specifically designed to measure them. Inasmuch as few of the scales designed to measure characteristics we have observed in intuitive thinkers actually correlate with our problem solving scores, it seems unnecessarily naive to hypothesize that the function, intuition, as measured by the Myers-Briggs would correlate directly with intuitive thinking as we have measured it on the problem solving scale. We can, however, hypothesize that the combination of sensation and intuition--the combination of responsiveness to details and the propensity to extrapolate to the implications of details--would be related to our intuitive problem solving performance. These two functions are precisely what is required to succeed on the intuitive problem solving task. This combination of emphases--themselves incompatible--yield the score for perception and can be compared with the propensity for judging, i.e., the combination of thinking and feeling. Such a score on the Myers-Briggs is the dimension identified as JP--from judgment to perception.

Consequently, a sample of 85 Ss was drawn from the parent population comprising VCFr60A and VCFr60B and their performances on the Myers-Briggs Type Indicator were compared with their intuitive problem solving scores. The correlations between the three principal problem solving scores and the principal Myers-Briggs scores appear in Table 9. IE is the dimension ranging from introversion to extraversion; SN is the dimension from the pole of sensation to that of intuition; TF is the dimension from the pole of thinking to the pole of feeling; JP is the dimension between the pole of judgment and that of perception. The three intuitive problem solving scores are familiar: R is Success, Cz is Information Demand; E is Efficiency, or the ratio of Success to Information Demand.

It can be seen that there is no relation between Introversion-Extraversion and any of the problem solving scores, nor is there any relation between the dimension of Sensation-Intuition and our problem solving scores. However, there is a significant positive correlation ($r=.27$, $p<.05$) between the tendency to judge events along a dimension of "like-dislike" rather than "true-false" and the tendency to require a large amount of information before reaching a conclusion. Similarly, there is a significant correlation between both Success and Efficiency and the JP dimension. Ss who relate to stimuli by perceptual responses rather than by judgmental responses, regardless of whether one perceives details or implications are more successful on intuitive problem solving, as hypothesized.

Thus, while the specific function of intuition, as an element in Jung's theory of personality is not directly related to intuitive problem solving as we have described and measured it in the present research, relevant aspects of the Jungian typology are related in a meaningful fashion to intuitive problem solving.

It should be pointed out that Jung's theory is not a theory of problem solving or a theory of knowledge, but a theory of personality, and the measurements made in the present research on problem solving would be modestly related, at best. It would seem, then, that as in our previous reports, the stable dimensions of problem solving which we have described touch other theoretically and empirically interesting areas in meaningful ways.

Retrospective Studies of Change

Measured change and awareness of change.

From the sample identified as VCFr63, comprising 448 Ss tested as freshmen (Cf. Westcott, 1968, Table 5-1), a sample of 50 was drawn when the Ss were seniors and retested on the intuitive problem solving scale. These 50 Ss were studied through an interview parallel to that reported by Westcott and Ranzoni (1963) on another sample. The questions were similar to those previously reported, but focussed on changes in interests and attitudes over the three and one-half years between the first and second testing. The analysis is focussed on a smaller sample of the fifty: a sample comprising individuals who displayed large changes in their Information Demand scores. This criterion was selected because this stylistic feature was more reliable than other measures on split-half studies, and was less reliable, i.e., more subject to influence, on test retest studies (Westcott, 1966). Further, the relationships between Information Demand and extra-test behaviors were generally the most interesting (Westcott and Ranzoni, 1963; Westcott, 1968, chapter 5).

From the sample of 50, Ss who showed a change in the Cz score of 100 points or more in either direction were selected. This score has an arbitrary mean of 1000 and an arbitrary SD of 50. The Ss were designated as Increasers or Decreasers, the former showing a higher Information Demand as seniors than as freshmen, and the latter showing a lower Information Demand as seniors than as freshmen.

The mean freshman and senior Information Demand scores of the two groups are shown in Table 10. It is evident that the freshman scores of the Decreasers, as a group, would have classified them as extreme performers according to the criteria previously used (Westcott and Ranzoni, 1963; Westcott, 1968, p. 113) but the Increasers would not have been an extreme classification as freshmen. As seniors, both groups show mean Information Demand scores which qualify as extreme performances, and the Decreasers show a greater overall change than do the Increasers.

The hypotheses were quite general, but it was expected that those who displayed the marked decrease in Information Demand would also display a greater freedom of action than the Increasers, in the light of earlier findings concerning the relationships of personality and attitude characteristics to Information Demand (Westcott and Ranzoni, 1963; Westcott, 1968, p. 119-148).

The questions asked were as follows:

1. Do you think you have changed much during the past three and one-half years?

2. In what ways do you think you have changed?

3. Have your interests changed? in what ways?

4. What sources of influence in these changes can you identify?

5. Do you remember your reactions to the problem-solving test as a freshman, and now as a senior? How did your reactions differ, if at all?

6. Do you like to take chances?

7. What are your plans for the next year or so?

The actual form of the question varied slightly from person to person, and a free exchange interview was maintained. The similarities and differences among the two groups are indicated in Table 11.

With respect to the awareness of change, the replies included such statements as, "completely"; ". . . I guess so, you can't help it, can you? . . ."; "not much, so far as I can tell . . ."; "not at all, in any important way . . . ." It is evident that the Ss who increased in their information requirements split evenly between positive and negative reports, while the Ss who decreased in Information Demand are much more frequently aware of changes in themselves.

Even those who initially reported little or no change were able to report some differences in themselves with further inquiry, and the kinds of change which were elicited by the second question show some interesting similarities and differences between these two groups of Ss. The most commonly reported change by both groups was an increase in tolerance of differences among people. Ss in both groups frequently said "I don't judge anymore . . ." "I don't try to impose my rules on others . . ." but at the same time they generally felt that they had more clear-cut standards for themselves than they had had as freshmen. Similarly, both groups reported an increase in social poise and confidence with considerable frequency, and in their ability to be intellectually critical.

The groups differ, however, in some interesting ways. A marked increase in self-awareness is shown by half of the Ss who decrease in Information Demand, and in one-third of those Ss who increase in Information Demand. Statements of this kind of change are, "I learned a lot about myself . . ."; "I feel much more like a whole person . . ."; "I've got some idea now about what I want to do and be." In contrast, half of the Increasers report their important changes as an awareness of the external world--both the world of persons and things: "I have a completely different perspective on the world."; "I see other people more as individuals . . ."; "I'm not awed by much of anything anymore . . ."; "I can be discriminating and critical of the things I see and hear. . . ." None of the Decreasers reported their changes this way.

One of the most marked differences is that the Decreasers point particularly to changes in confidence in their own judgment. Three-quarters of these S̲s state this specifically, while only one-third of the Increasers identify this change.

Thus, there are both similarities and differences, with the Decreasers tending to identify changes in their perceptions of themselves, while the Increasers tend to report changes in their perceptions of the world outside themselves. The sizes of the samples are small, of course, and most of the differences are also small, but the increasing sensitivity to one's own reactions among the Decreasers, and the increasing sensitivity to the world about one is in accord with our earlier findings with respect to personality differences and Information Demand (Westcott and Ranzoni, 1963; Westcott, 1968).

With respect to interests, a similar pattern is present. Among the Increasers, one-third report that they have not changed at all, while none of the Decreasers report this. Of the changes of interest which reflect concrete new areas of exposure--e.g., art, skiing, sciences, folk music, the two groups do not differ, but a much more subtle difference does exist. The Decreasers report changes in their approach to their old interests, i.e., that they are more discriminating, more critical, more diversified or deeper about their old interests, while the Increasers do not report this at all. Again, it appears that there is a difference in the subtlety with which the two groups view their own reactions to things, with the Decreasers being much more sensitive and subtle than the Increasers.

When we look at the sources of influence which the S̲s report as contributing to the changes noted above, their student peers seem to be relatively unimportant. In contrast, the Decreasers report a male peer as a particularly important influence more often than do the Increasers. This influence has sometimes occurred in a romantic context, and sometimes in a purely intellectual one. Teachers are important influences for the Increasers more often than for the Decreasers.

Closer to the immediate situation, the Ss reactions to the testing situation were explored. The Decreasers split evenly between strong liking and strong disliking for the task, with no moderate reactions, while two-thirds of the Increasers were moderate in their reactions and none of them liked it very much. More than half the Decreasers liked it better as seniors than they did as freshmen (as far as they could remember) while none of the Increasers report this. On the contrary, two-thirds of the Increasers reported no change in their evaluation. One particular change in reaction to the testing is that three-quarters of the Decreasers reported higher confidence as seniors than as freshmen, while only one-third of the Increasers reported this.

As in previous interview studies, the appreciation of and enjoyment of risk were explored. As reported earlier (Westcott and Ranzoni, 1963) the low Information Demand Ss tended to enjoy risk very much, while high Information Demand Ss enjoyed it far less. This was borne out in the present study, although not as dramatically as reported earlier. While the Increasers and Decreasers both show slightly more than half of the Ss with moderate liking or disliking for risk, the Decreasers have no Ss who actively dislike or unalterably oppose risk, while the Increasers have no representatives who actively and unalterably support risk as a pleasure.

Looking at the future prospects of these two groups of individuals who have shown dramatically opposite forms of change, we find more flexibility and uncertainty among the Decreasers than among the Increasers. The Increasers are all committed to one or another fixed alternative--all will either be married, be in specific graduate study programs, or be in a specific job within the next few months; among the Decreasers, half are still entertaining viable alternatives, and the most frequent specific commitment is to a rather non-specific set of travel plans--that is, they said they would be travelling, but they did not have fixed itineraries.

A pattern can be deduced: Those who increased in their demands for information report less change than do those who decrease in their demands for information, and the changes reported show those who come to require less information to be sensitive to changes located in themselves. They appear to have become more intellectual in their interests and to have gained significant confidence in their own judgment in intellectual pursuits. The Increasers are relatively less changed, and locate changes in responses to the outside world. The changes were acknowledged as induced by different agents: For the Decreasers, male peers were influential twice as often as for the Increasers, while specific teachers were influential four times as often for the Increasers as for the Decreasers.

The Decreasers are more congenial to risk, as we found earlier with low Information Demand Ss, and their immediate future plans show a much lower degree of fixedness than is the case for the Increasers.

As hypothesized, the Ss who become lower in their Information Demand during the time between the two testings take on some of the characteristics of low Information Demand Ss while Ss who increase on Information Demand, take on some of the characteristics appropriate to that group.

Self-appraisal of thinking processes and change.

From the parent populations VCFr60A and VCFr60B, the members of the four extreme groups were interviewed with respect to their thinking processes during their senior year in college. It was of interest to determine the extent to which they were aware of differences in their problem-solving behavior, and whether differences uncovered related to the kinds of differences which identified them as members of extreme groups on the intuitive problem solving task. The interview was oriented around the simple (or complex) question, "How do you think?" This was then elaborated in regard to what changes had occurred in their thinking over the period of three and one-half years they had been in college. Finally, they were asked what plans they had for the next few years.

There were eight members of Group 1--intuitive thinkers, 13 members of Group 2--wild guessers, 13 members of Group 3--cautious successes, and 14 members of Group 4--the cautious failures. In Table 12, it can be seen that the ability to reply meaningfully to the broad question, "how do you think," is not randomly distributed among the four groups. The difference between replies and inability to reply without further prompting approaches significance at the .10 level ($X^2 = 6.2$ df = 6). The members of Group 1 tend to be more ready to reply than any of the other groups, and at the other extreme, among the members of Group 4, there are more blocked or indeterminate replies than direct answers. The kinds of replies that were scorable included such words and phrases as "visually," "in images," "in logical sequences," "by insight," "out loud," "in writing," "intuitively," "step by step" and so on. Blocked responses included such replies as "I don't understand what you mean," or "I don't know," while indeterminate replies were mostly evaluative, such as "badly" or"very sloppy" or "it all depends . . ." without further satisfactory clarification.

Some additional replies were obtained through probing, and from the total replies which were eventually scorable, some Ss clearly placed themselves along a dimension from logical step-by-step work to insight or intuitive thinking.

In Table 13 are indicated the numbers of Ss reporting themselves along this dimension in the different groups, and their locations on this dimension. Group 1 has four members on this dimension, Group 2 has nine, Group 3 has 12, and Group 4 has seven. Of these totals, Table 14 combines Ss in each group who claim to use intuitive methods exclusively or preferably for comparison with those who claim to use non-intuitive methods exclusively or preferably. It is evident that Groups 1 and 2 split about evenly on the two methods while Groups 3 and 4 claim much heavier reliance on the non-intuitive methods. Indeed Group 4 has no members at all who acknowledge use of intuitive methods. In Table 14, $X^2 = 5.05$, df = 3, approaching the .10 level of confidence.

While it may not be possible to say that the two low Information Demand groups identify themselves as intuitive thinkers, it is possible to say that the two high Information Demand groups identify themselves as non-intuitive thinkers.

The second type of question pursued concerned the kinds of changes which had occurred in the *S*s thinking processes, insofar as they could report. First, with respect to whether the college experience had helped or hindered their reported abilities to think, Table 15 shows the distribution of "helped," "hindered" and "no change" replies in the different groups. It is evident that *S*s in Groups 1, 3, and 4 report predominantly better thinking after three and one-half years of college, while Group 2 more frequently reports hindrance than help. When the two low *Success* groups (2 and 4) are combined for comparison with the two high *Success* groups (1 and 3) it appears that there is a tendency toward a relationship between success on the problem solving scale and a feeling of improvement in one's thinking (Table 16). In this distribution, X^2 again approaches the .10 level of confidence.

The kinds of improvements reported are too varied to detail, but they include such comments as, "I know a lot more." "I can think more broadly." "I can think about things I didn't even know existed before." "I'm more analytical." "I can be more critical." "I'm more confident." This last is the most common single reply, having been reported by 10 different *S*s. The changes reported were grouped by their reference to content or to process, and the distribution of content changes and process changes is shown in Table 17. We note that emphasis on content or process differs from group to group, with the extreme groups, 1 and 4, showing almost diametrically opposed patterns ($X^2 = 8.80$, df = 3, $p < .05$).

Finally, *S*s were asked what their immediate post college plans were. The responses included immediate marriage, with no plans for academic work or specific employment or career; various combinations of school and work, marriage and school, marriage and work; specific pursuit of a job or training for a career with no expectation of marriage. The responses were coded into seven categories, as follows: 1) complete domesticity, with neither desires or plans for vocation or profession; 2) dominant interest and plans for marriage and family, with passing reference to "keeping busy" with some outside activities; 3) dominant interest in family, with rather specific plans for following academic or professional interests; 4) commitment to both marriage and employment, but somewhat vague; 5) clear investment in both family and career; 6) career orientation with interest in family as well; 7) plans for career and no plans for marriage and family. Table 18 shows the distribution of ratings across the four groups.

There is no indication of any clear differentiation among the four groups in this distribution. The groups and ratings may be combined in various rational ways, one of which appears in Table 19. Here, the primarily domestic orientations (ratings 1, 2, 3) are compared with the predominantly career orientations (ratings 5, 6, 7) for the four groups. Chi-square is not significant, but there may be noted a tendency for Groups 2 and 4 to be divided 2 to 1 in the direction of domestic orientation, while groups 1 and 3 are about evenly split between the domestic and career orientations.

If we combine the ratings as in Table 20, comparing commitment to both marriage and career with the more exclusive orientations, i.e., ratings 4+5 compared with all others, the results indicate that Group 3 has the most frequent plans for a clear and apparently realistic combination. Once again, Chi-square approaches significance at the .05 level ($X^2 = 7.30$, df = 3, P falls between .05 and .10). In a later section, we shall have a chance to see what Ss do after they leave college.

From the above data, there is evidence that the individuals who have been identified as very different kinds of thinkers perceive their thinking differently. The successful intuitive thinkers may be characterized as more sensitive to how they go about thinking and problem solving, although they do not report exclusive reliance on intuitive methods. Predominantly, they feel that their college experience has helped them, and most dramatically in terms of the processes of thinking rather than in terms of content. Their most frequently reported aid is along the dimension of confidence.

Group 2, the wild guessers, are less clear on how they think, as a group, but of those who do reply, nearly half state that they rely exclusively on intuitive methods. At the same time, more than half of them report either no change in their thinking after three and one-half years of college, or a hindrance. It may be that their unsuccessful use of intuitive methods has shaken their confidence but they have not yet acquired new methods of problem solving. Their interest in the thinking process is indicated by the fact that more than half of the reported changes in thinking are in terms of form or process rather than in terms of content. Group 3 replies clearly about how they think. About one third of those who reply claim to use intuitive methods exclusively, while two-thirds rely on non-intuitive methods. They generally feel they have been helped by their college experience, but the help reported is split evenly between process change and content change. Group 4 members are able to deal with the initial question barely one-third of the time. Of those who do finally reply, none claim any use of intuitive methods, but most of them feel that college has helped them with their thinking. The help reported has been predominantly in terms of adding content rather than in terms of altering process.

While we noted earlier some interesting and coherent differences in the short-term plans of the members of the four groups, the long term plans do not distinguish them reliably. We note (Table 19) that there is a tendency for Groups 2 and 4 to plan the more conventional domestic future, while Groups 1 and 3 plan more diversified experience. It is interesting to note that while Group 1 has always shown a high frequency of unconventionality, the willingness for, and probability of, unconventional (and successful) behavior among members of Groups 2 and 3 continually swings back and forth. We have reported elsewhere (Westcott and Ranzoni, 1963) that Group 2 tends toward a desperate and insecure kind of diversity, while Group 3 members typically do whatever they do with confidence. It may be that in the long run the conventionality and security of Group 3 will allow a less conventional life, while the insecurity of Group 2 may prevent it.

Post-College Experience of Extreme Performers

In 1966, a questionnaire was sent to all Ss who had been identified as extreme performers while in college and who had graduated in the classes of 1960, 1961 and 1963. The total number of Ss in each extreme group, for the purposes of this study, is indicated in Table 21.

The questionnaire asked direct questions about the kinds of experience S had had with further education, with employment, and with marriage and family. The replies are tabulated in Table 21, and some interesting patterns may be deduced which differentiate these extreme groups.

First, the proportion of responses received from the groups differ significantly ($X^2 = 8.36$, df = 3, $p < .05$). It is surprising that Group 2, the wild guessers, who we have consistently found to be the most resistive and uninterested in adapting to social demands, yields the highest response rate. Group 4, the cautious failures, on the other hand, has been consistently the most passive and over-awed by authority, but in this case yields the lowest response rate. It is also true that Group 4 has indicated a kind of disorganization about their lives which might contribute to a difficulty in getting a questionnaire filled out and returned, so their low rate is partially explainable on that basis.

As a baseline, we should also note that the mean number of years post-college at the time of returning the questionnaire is highest for Group 1 and lowest for Group 3. They differ by nearly a full year, and this is partially explainable on the basis of the differential representation of each of the four groups in each of the three classes. When considering further data about their experience, this time differential must be taken into account.

With respect to post-graduate education, it is evident that fewer members of Group 4 have pursued this kind of activity than have the members of any other group. When Group 4 is compared with Groups 1, 2, and 3 combined, $X^2 = 2.93$, df = 1, and the level of confidence lies between .10 and .05. As a reasonable consequence, the proportion of Group 4 attaining advanced degrees and continuing to pursue post-graduate education is low.

In contrast, Group 3 is highest in all aspects of post-graduate education. More of them entered such programs, more completed some degrees, more are still in such programs than in any of the other groups. Again, with respect to the personality and attitude characteristics of Group 3 discussed elsewhere (Westcott and Ranzoni, 1963; Westcott, 1968, p. 146) it would seem that the restraints imposed and the rewards provided by graduate programs would be most congenial to them. These _S_s have consistently been found to be cautious, persistent, successful, respectful of authority although not terrified by it, willing to be conventional but able to entertain some unconventional alternatives at the same time.

By the same reasoning, it is not surprising--although it may be disappointing--that such a low proportion of Group 1, the intuitive thinkers, continue to pursue further education. Nearly half entered post-graduate programs, but only about one-fourth attained the Master's degree or equivalent, and even fewer pursued education further.

The characteristics which the intuitive thinkers have shown consistently--independence, self-directed investment, dislike of imposed order--would not be likely to lead them to select a highly formalized and structured enterprize which has fairly conventional standards and rewards. They might be expected to avoid all but the most unusual post-graduate programs, or in fact, to avoid graduate programs entirely.

Recall that performance on the intuitive problem solving task which classifies these Ss as members of one or another extreme group is not related to educational success in college (Westcott, 1968, p. 117), so the results are not attributable to academic prowess. Rather, the personality and attitude characteristics lead one to expect that Group 4 would be least likely to pursue education further, for their own reasons; Group 1 is unlikely for a different set of reasons, while Group 3 seems best adapted and most likely to succeed in such an enterprise.

With respect to employment, the great majority of all the groups have been employed at some time since graduation, and all of them have held an average of about two different jobs. Taken in conjunction with the next category--marriage--this shows some differentiations which are not immediately evident.

The proportion of Ss in each group married rise from Group 1 with 54 percent, to Group 4 with 88 percent, but the years between graduation and marriage is related in the opposite direction. That is, Group 1 has the fewest members married, but they tend to marry earlier; Group 4 has the greatest proportion married, but they marry later, by nearly two years. Group 4 also has the second highest number of children per marriage, the smallest number of years married, and the shortest time between marriage and the birth of children. They also have the fewest childless marriages of any group. Thus, they appear to enter domesticity late, but enter marriage with all sails set. Group 3, with the highest proportion in graduate school and the second highest proportion married, has the fewest children and the largest proportion--67 percent--of marriages with no children.

As a final note, Group 1 has the largest proportion of wives working, and Group 4 has the largest proportion of members married to men with higher academic or professional degrees.

A summary may be offered: Group 1 members tend to marry while in college, or very soon thereafter, but five years later, only about half of them are married at all. All of them have been employed at one time or another since graduation. About half of them entered post-graduate work, about one-fourth attained the master's level, while only about 9 percent are still students. Of those who are married, half are employed, 84 percent have children, and half of them are married to husbands who have advanced degrees.

Members of Group 2 tend to marry about one year after graduation, and at the time of study, slightly over half were married. About half of them entered graduate programs, and more than one-third reached the Master's level or equivalent. 16 percent are pursuing work beyond that level. Almost all of them have been employed at some time and of those who are married, almost 80 percent have children and over 30 percent are still employed.

Group 3 Ss marry later than the preceding two groups--about 1.5 years after graduation, and at the time of report, 3/4 of them were married. More than half had entered post-graduate educational programs, and a quarter of them are still students pursuing higher degrees. Almost all of them have been employed at some time, and of those who are married, about 1/4 are still employed. They tend to have fewer children than any other group, with 67 percent of them childless after an average marriage duration of more than two years.

Group 4 members replied least frequently to the questionnaire, and indicate the longest delay between college and marriage. They do not fill this time with post-graduate study, as they show the smallest proportion of all entered in such programs. At the same time they indicate the lowest proportion who have ever been employed. Their marriages are an average of more than two years after graduation, and at the time of report, 88 percent were married, and 88 percent of those married had children. These represent the highest proportions of all the groups. Further, more of these Ss marry men with higher academic and professional degrees.

At this point the reader may refer back to Tables 18, 19, and 20 which indicate the stated plans of members of the various extreme groups. The Ss included in Tables 18, 19, and 20 are not the same as those replying to the questionnaire, but they are the same with respect to their intuitive problem solving performance and their membership in extreme groups. It appears that Group 3 Ss who indicated most frequently a set of plans for marriage and career (Table 20) do, in fact, carry such plans out. Similarly, Group 4 members, who most frequently indicated plans for extreme domesticity, have carried out those plans. Neither Group 1 nor Group 2 distinguish themselves particularly with respect to their plans; similarly, another group of Ss from Groups 1 and 2 do not distinguish themselves with respect to their actual post-college behavior.

DISCUSSION

The principal aim of this discussion will be to integrate the findings reported with respect to extreme performances on the intuitive problem solving task. Particular reference will be made, of course, to the four extreme groups.

Group 1, the intuitive thinkers, had patterns of preference for a variety of occupations which are typically risky or masculine, but they had no outstanding academic preference patterns. These data are in keeping with our earlier findings of preference for risks and the diversity of academic areas from which these Ss come. They also showed an interest in short-term planning as compared to long-term planning, and a preference for small groups rather than large ones. These too, are in accord with previously published findings concerning their intensity of investment and their general social separateness.

Their interests tend to be abstract, and not focussed on either people or business, and these findings are not surprising in the light of earlier studies of these intuitive thinkers. Their somewhat asocial orientation is in conjunction with a considerable sensitivity to themselves and an awareness of what they, themselves think and how they think. They are aware of changes, and can identify the kinds and sources of change, but they are relatively less committed to any long term practical plans. Their post-college plans are not distinguished, but do tend to remain open to alternatives, and their post college behavior and experience does not distinguish them in any of the areas we have explored. They are, perhaps, most notable for early marriage and, at the same time, for being least likely to marry.

The tendencies toward independence of judgment and toward a comfortable kind of non-conformity keep these people out of the main stream of their culture, and keep them from the institutionalized forms of restraint and reward. So far, since graduation from college, they have not distinguished themselves nor have they appeared to fulfill the promise they showed during college for imaginative and independent innovation. In previous discussions (e.g. Westcott, 1968, p. 190-196) we have indicated that the propensity for intuitive thinking is not in marked favor in our culture or in our cultural institutions, and the road to be followed by an intuitive thinker is rarely expected to be a straight one. We have suggested that the bulk of our educational system and the rest of our social institutions are well designed to eliminate this propensity or at least to stifle it, and we cannot be too surprised that intuitive thinkers have not articulated with it very well.

By the same token, we might expect Group 2 Ss, the wild guessers, to be relatively undistinguished. In addition to their propensity for acting on minimum information, they have a striking propensity for reaching the wrong conclusions. At the very least, they should be open to correction, but their tendency to be headstrong and agressively cocksure makes them rather unlikely to benefit from corrective action. Indeed, they feel that their college experience has damaged their abilities to think--perhaps by obliging them to be somewhat more critical of their thinking and its products than they were before. This group is not distinguished by positive interests in vocations, but by the lack of interest in some which require patience and tact, and their distinguishing academic interests seem to be limited to a mathematical cluster. There has been no previous evidence of this mathematical interest in members of Group 2 from other samples. Again, we see that they have a confidence in their abilities to manipulate people (Cf. Westcott, 1968, p. 137) and this takes an institutionalized form in their preference for occupations of professional service. They also share some of the abstract and masculine interests of the preceding group, and they are quite clearly uninterested in social service or business activities. These findings are all in reasonable accord with previously published findings, and indicate that these Ss are quite confident socially, but also lack the patience and concern for others which would make them genuinely rewarding--and rewarded--social beings.

They share with the preceding group--but to a reduced extent--a sensitivity to their own thought processes and the changes which occur in these. As noted above, they feel that college has damaged their thinking, and their aspirations for further academic work and career activities are rather low. In post-college experience, they have not distinguished themselves in any way which we have found, but they do provide a surprise in that they reply to our questionnaire significantly more often than any of the other groups.

As might be expected, Group 3, the careful successful problem solvers fit in well with the culturally dominant roles of women. They show vocational preferences for the occupations of music teacher and librarian, and they prefer the well-ordered academic subjects of civics and geometry. They would rather work for a curteous superior than work for themselves, and their principal major area of occupational preference is in the social services. They are least interested in the masculine occupations and in those of the abstract scientist.

These data are well within the framework of our previous findings which indicate that Group 3 S̲s are most well socialized, most fully in the mainstream of the culture, and have the best of both the intellectual and social worlds. Just as they were not very aware of influences on their behavior or the sources of change reported earlier (Westcott and Ranzoni, 1963, p. 607-608), the changes which they do acknowledge in their thinking processes and their interests tend to be content-oriented and relatively superficial. They indicate clearly that their thinking was helped by college, and they are quite clear that they do not think in a manner which could be called "intuitive." Consonnant with their concrete and rather unquestioned grasp of the world, they state a moderate and well-ordered set of plans for the future which include well formulated plans for investment in both marriage and a career.

In the terms of the contemporary world, this group has distinguished itself in its post-college experience. More than half of this group enrolled in post-graduate education, and nearly all of that number reached the Master's level. A quarter of them are still in school pursuing further degrees, four years later. This is a higher proportion than for any other group, and as noted earlier, their personality characteristics and preferences make them particularly adaptable to graduate education. Three-quarters of this group are married, but only one-third of the married women have children, and only one-quarter are employed. More than three-quarters of the husbands hold advanced professional or academic degrees.

Thus, it appears that the careful successful problem solvers continue after college to conduct careful successful lives, accepting the restraints of their chosen activities and reaping the rewards of them.

The final group, the cautious failures on the problem solving scale, did not distinguish themselves as failures in college work, nor do they distinguish themselves as particularly unsuccessful after college. Their interests and attitudes do differentiate them from the other groups, but in rather subtle ways which may make little difference in the day to day world.

As pointed out earlier (Westcott, 1968, p. 147), they have little liking for political activity, and more interest in the activities of the clergy as possible vocations. Their interests in academic subjects tend to be relatively high in undifferentiated nature study, and low with respect to mathematics. They consider themselves (as we have found before) unlikely to rebel in the face of authority, and they show little active preference for any occupations. Here, again, we may be witnessing the passivity which has characterized this group in other studies (Cf. Westcott, 1968, p. 140). They are likely to be relatively unaware and uncritical, and are not likely to know much about themselves--how they think, what they prefer, and so on. They do know, however, that they do not think "intuitively." This seems to be the only real indication they can give of their thinking processes, and any improvements or changes they report tend to be in terms of the content of thinking rather than in terms of the processes.

Their plans for the future are predominantly domestic and appear to be very much in the cultural mold. The experience they do report after college is in accord with the plans stated by Group 4 members when they were in college. While they tend to marry later than the other groups do, they marry most frequently of all the groups, and they pursue employment or post-graduate education least often. The men they marry are predominantly professional men, and they almost all have children. These Ss appear to have established a firm base for themselves in the domestic scene, and probably find there the kind of security they never found in the academic enterprise.

We can note here that earlier evidence has shown the stability of the tendency to solve problems in particular ways (Westcott, 1966). Within this stability, however, there is some room for change, and our current study of individuals who do change their problem-solving strategies dramatically indicate some coherent change in other spheres of their lives as well. They tend to take on some of the characteristics of persons who they come to resemble in problem solving behavior.

CONCLUSIONS

The most important conclusions to be reached from the data and discussion so far presented are as follows:

1. There is coherence and continuity in the conceptual formulation presented. That is to say, the behaviorally based conception of intuition on which this research hinges is continuous with the philosophical tradition of the study of intuition, and is firmly rooted in both historical and contemporary psychological theory. Thus, the conception is viable.

2. There is coherence in the empirical data offered as a result of the study of individual differences in the propensity for solving problems intuitively. That is to say, from a variety of samples and with a variety of investigative techniques, an evolving picture of the functions, correlates, and consequences of intuitive thinking begins to emerge. It is possible to assert reliably that an individual has one or another propensity for intuitive problem solving, and it is possible to describe some of the concurrent and relatively long-term characteristics of behavior which are likely to be associated with that propensity. Thus, the empirical study of individual differences in intuitive thinking is empirically feasible and psychologically meaningful.

3. The above assertions of a viable conceptual base and a coherent and meaningful body of empirical data augur well for continued research in several directions. First, continued research in alternative laboratory situations, aimed at broadening the empirical base for the investigation of intuitive thinking in relatively well-controlled situations. Second, the expansion of the empirical base to "real life" situations, in which chemists solve problems in chemistry, engineers solve problems in engineering, clinicians solve clinical problems--all under conditions of progressive information gathering and use. Some efforts have been made in this direction in medical situations, e.g. Rimoldi (1964); Sprosty (1964), but the aim of this work was rather different.

Third, research needs to be directed toward the possible manipulations of educational situations to maximize the learning of individuals who display such dramatically different styles of thinking (Cf. Westcott, 1968, p. 190-203).

4. We conclude that the study of intuitive thinking in the format offered and followed by this research project has brought an historically fascinating and critical concept into the realm of modern psychology, and may have many consequences for the conduct of research and education.

SUMMARY

This report has served as a review of previously published work and as an addendum to it. The conception of intuition has been traced from the roots of philosophical intuitionism through modern positivism to contemporary psychological thinking. The few empirical data gathered prior to 1960 have been reviewed and related to such well-established areas of psychological research as social judgment, learning without awareness, and the microgenetic study of perception. These behavioral phenomena were seen as examples of behavior based on deprived or reduced information, and intuition was seen as another, perhaps more global, phenomenon of the same class.

Problem solving, studied in a situation where information is at a premium, and where Ss are to solve problems on as little information as possible, was described as an operational approach to the study of intuition. Data on individual differences and the stability and change of these individual differences were reviewed and an array of personality and attitude correlates was described. Behavioral characteristics of Ss who showed extreme problem-solving behavior while in college were studied up to five years post-college. Coherent patterns of continuing difference emerged, and suggestions for further research were offered.

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APPENDIX

Table 1. Stated vocational preferences and dislikes which discriminate between single criterion groups and all other extreme groups combined.

Vocation	Criterion group mean pref.	Other groups mean pref.	t	p
	Group 1 N = 5			
Rancher	3.00	2.31	4.93	<.01
Surgeon	3.00	2.38	2.47	<.01
Musician	3.00	2.63	2.47	<.02
Manufacturer	2.50	1.77	2.86	<.01
Stockbroker	2.83	2.09	3.22	<.01
	Group 2 N = 7			
Real Estate Salesman	1.18	1.81	3.71	<.01
Music Teacher	1.54	2.19	2.74	<.01
	Group 3 N = 7			
Music Teacher	2.50	1.82	2.56	<.02
Librarian	2.40	1.71	2.46	<.02
	Group 4 N = 9			
Clergyman	2.36	1.63	2.61	<.02
Politician	1.63	2.22	2.36	<.05

Table 2. Stated liking and disliking for school subjects which discriminate between single criterion groups and all other extreme groups combined.

Subject	Criterion group mean pref.	Other groups mean pref.	t	p
	Group 1			
Geology	1.67	2.22	2.39	$<.05$
Philosophy	1.83	2.75	2.04	$<.05$
	Group 2			
Calculus	2.55	1.78	3.50	$<.01$
Algebra	2.91	2.41	2.78	$<.01$
Arithmetic	2.73	2.26	2.35	$<.05$
	Group 3			
Geometry	2.80	2.14	3.80	$<.01$
Civics	2.70	2.18	2.08	$<.05$
	Group 4			
Nature Study	2.82	2.07	3.75	$<.01$
Mathematics	1.73	2.48	2.42	$<.05$

Table 3. Miscellaneous preferences and statements of opinion which discriminate between single criterion groups and all other extreme groups combined.

Preference or opinion	Criterion group mean rating	Other groups mean rating	t	p
	Group 1			
Preference for planning for immediate future as compared to planning for 5 years ahead	3.00	2.41	4.21	<.01
Preference for amusements in small groups or alone as compared to in a crowd	3.00		4.16	<.01
	Group 2			
Confidence in ability to get others to do what they want	2.91	2.30	3.67	<.01
	Group 3			
Working for oneself as compared to working for a superior	2.20	2.79	2.74	<.01
Value placed on courteous treatment from superiors	2.40	1.64	3.80	<.01
	Group 4			
Liklihood of rebelling at orders from another, as compared with enthusiastic compliance	1.55	2.22	2.49	<.02

Table 4. Ranks and sum of ranks on subscales of the professional practitioner cluster for the four extreme groups.

Scale	Rank Group 1	Group 2	Group 3	Group 4
Artist	4	2	3	1
Psychologist	4	2	1	3
Architect	3	2	4	1
Physician	4	1	3	2
Psychiatrist	4	2	1	3
Osteopath	4	1	2	3
Dentist	3	2	4	1
Veterinarian	3	2	4	1
Sum R	29	14	22	15

$X^2_R = 10.95$, $p < .02$

Table 5. Ranks and sum of ranks on subscales of the physical-abstract scientist cluster for the four extreme groups.

Scale	Rank Group 1	Group 2	Group 3	Group 4
Mathematician	2	3	4	1
Physicist	1	2	4	3
Chemist	1	2	4	3
Engineer	1	2	4	3
Sum R	5	9	16	10

$X^2_R = 9.30$, $p < .05$

Table 6. Ranks and sum of ranks on subscales of the masculine-practical-manual cluster for the four extreme groups.

Scale	Rank			
	Group 1	Group 2	Group 3	Group 4
Farmer	1	2	4	3
Carpenter	1	3	4	2
Forest Service Man	1	2	4	3
Aviator	1	2	4	3
Printer	1	2	4	3
Math-Science Teacher	2	1	3	4
Policeman	1	3	4	2
Army Officer	1	2	3	4
Sum R	9	17	30	24

$X^2_R = 18.45, p < .01$

Table 7. Ranks and sum of ranks on subscales of the social service cluster for the four extreme groups.

Scale	Rank			
	Group 1	Group 2	Group 3	Group 4
YMCA Phys. Director	4	3	1	2
Personnel Administrator	3	2	1	4
Public Administrator	3	2	1	4
Vocational Counsellor	4	2	1	3
YMCA Secretary	4	2	1	3
Physical Therapist	3	1	2	4
Social Worker	4	2	1	3
Social Science Teacher	4	2	1	3
School Superintendent	4	2	1	3
Minister	4	3	1	2
Sum R	37	21	11	31

$X^2_R = 23.52, p < .01$

Table 8. Ranks and sum of ranks on subscales of the business cluster for the four extreme groups.

Scale	Rank			
	Group 1	Group 2	Group 3	Group 4
Senior CPA	1	2	3	4
Junior Accountant	2	3	1	4
Office Worker	2	3	1	4
Credit Manager	3	2	1	4
Purchasing Agent	1	4	2	3
Business Educ. Teacher	3	2	1	4
Banker	3	4	2	1
Mortician	4	2	1	3
Pharmacist	4	2	1	3
Sum R	23	24	13	30

$X^2_R = 9.93$, $p < .02$

Table 9. Correlations (r) between intuitive problem-solving scores and scores on the Myers-Briggs Type Indicator. See text for descriptions of scores. N = 85

	IE	SN	TF	JP
R	.09	-.06	-.03	.28**
Cz	.05	-.11	.27*	-.02
E	.04	.04	-.16	.25*

* $p < .05$
** $p < .01$

Table 10. Information Demand scores of Increasers and Decreasers as freshmen and as seniors.

	Increasers N = 6		Decreasers N = 8	
	Freshman	Senior	Freshman	Senior
$\overline{X}$	975	1081	1070	902
$\overline{X}$ change	+106		-168	

Table 11. Responses to interview queations for Increasers and Decreasers.

	Increasers N = 6	Decreasers N = 8
1. Reported change.		
Yes (definite or probable)	3	6
No (definite or probable)	3	2
2. Kinds of change.		
Increased awareness of self	2	4
Increased awareness of outside world	3	0
Increased confidence in own judgment	2	6
Increased liberalness and tolerance	5	6
Increased intellectual critical ability	3	4
Increased social ease and confidence	4	4
3. Changes of interests.		
No change reported	2	0
New specific interests	4	4
Same interests, with greater depth, discrimination and criticism	0	7
4. Sources of influence.		
Female peer	1	1
Male peer	2	5
Teachers	3	1
5. Reactions to tests.		
Strong positive	0	4
Moderate interest	4	0
Strong negative	2	4
Recall dislike as freshman	1	5
More positive as senior	0	5
No change in evaluation	4	1
More confident as senior	2	6

Table 11 continued

	Increasers N = 6	Decreasers N = 8
6. Enjoyment of risk.		
Yes, certain	0	3
Yes-no, qualified	4	5
No, certain	2	0
7. Immediate future plans.		
Marriage within six months	2	1
Specific graduate or professional school	3	2
Specific travel	0	3
Undecided among real alternatives	0	4
Specific job	1	0

Table 12. Replies to the question "How do you think?" among the four extreme groups.

	Group 1	Group 2	Group 3	Group 4
Clear reply	7	7	7	5
Blocked	1	4	5	6
Unscorable	0	2	1	3

X^2 = 6.2 df: 6, p approaches .10

Table 13. Categories of scorable replies from the four extreme groups on the dimension intuitive-nonintuitive.

	Group 1	Group 2	Group 3	Group 4
Intuitive only	1	4	4	0
Prefer intuitive	1	1	0	0
Non-intuitive only	1	2	7	5
Prefer non-intuitive	1	2	1	2

Table 14. Combined intuitive vs. non-intuitive preferences among the four extreme groups.

	Group 1	Group 2	Group 3	Group 4
Intuitive	2	5	4	0
Non-intuitive	2	4	8	7

$X^2 = 5.05$, df = 3, p approaches .10

Table 15. Reported impact of college on thinking ability of the four extreme groups.

	Group 1	Group 2	Group 3	Group 4
Helped	6	5	9	9
Hindered	1	6	3	4
No change	1	2	1	1

Table 16. Comparison of high Success Ss (Groups 1 and 3) with low Success Ss (Groups 2 and 4) in reported help or hindrance of thinking during college.

	Groups 1 and 3	Groups 2 and 4
Helped	15	14
Hindered	4	10

$X^2 = 2.05$, df = 1, p approaches .10

Table 17. Focus on changes in form of thinking vs. content of thinking among the four extreme groups.

	Group 1	Group 2	Group 3	Group 4
Content	0	3	4	5
Form	6	5	4	1

$X^2 = 8.80$, df = 3, $p < .05$

Table 18. Distribution of categories of post-college plans for the four extreme groups.

Category	Group 1	Group 2	Group 3	Group 4	Total
1	2	4	1	1	8
2	0	0	1	3	4
3	1	3	2	4	10
4	1	2	6	1	10
5	2	2	2	2	8
6	1	2	1	1	5
7	1	0	0	0	1

Table 19. Post-college plans of the four extreme groups.

	Group 1	Group 2	Group 3	Group 4
Ratings 1+2+3	3	7	4	8
Ratings 5+6+7	4	4	3	3

$X^2 = 1.65$, N.S.

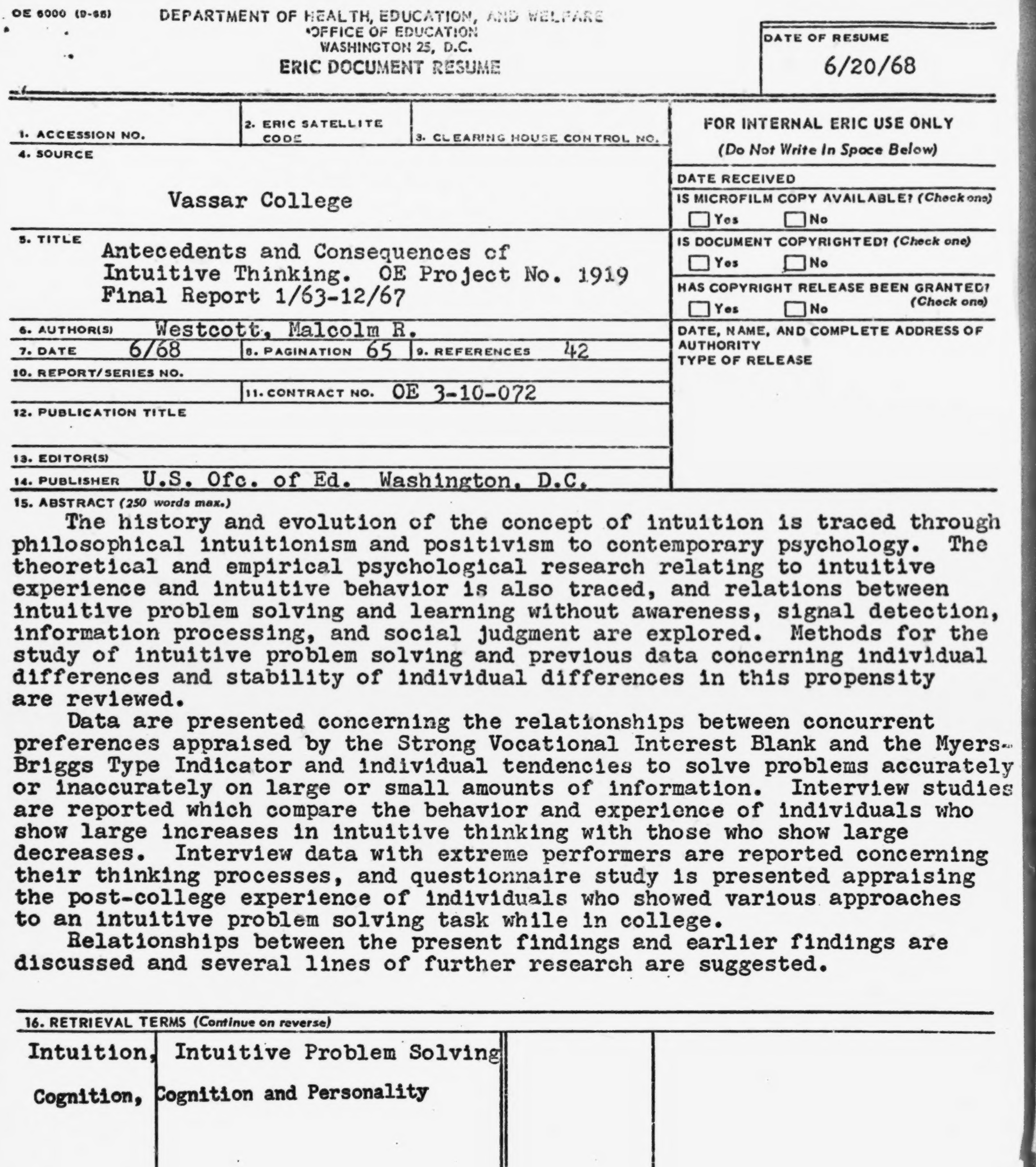
Table 20. Stated plans for both marriage and career as compared to more exclusive commitments.

	Group 1	Group 2	Group 3	Group 4
Categories 4+5	3	4	8	3
All other categories	5	9	5	11

$X^2 = 7.30$, df = 3, p between .10 and .05

Table 21. Post-college experience of extreme groups.

	Group 1	Group 2	Group 3	Group 4
Total number solicited	20	25	23	25
Total replies (N)	11	19	12	9
Percent replies	55	76	52	36
$\bar{X}$ years post-college	4.8	4.5	4.0	4.3
Percent enrolled in post-graduate work	45	47	58	33
Percent hold MA or equivalent	27	37	42	11
Percent work toward or hold further degree	18	16	25	11
Percent student at present	9	16	25	11
Employed at any time	100	84	92	78
Percent married	54	58	75	88
$\bar{X}$ years married	5.2	3.9	2.4	1.9
$\bar{X}$ years between graduation and marriage	.3	.9	1.5	2.2
$\bar{X}$ number of children	1.7	1.1	.6	1.3
Percent childless	16	21	67	12
Percent married and working	50	31	25	38
$\bar{X}$ years between marriage and children	2.2	2.3	2.0	1.8
Percent husbands with advanced degrees	50	45	78	88



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4. SOURCE Vassar College

5. TITLE Antecedents and Consequences of Intuitive Thinking. OE Project No. 1919 Final Report 1/63-12/67

6. AUTHOR(S) Westcott, Malcolm R.

7. DATE 6/68 8. PAGINATION 65 9. REFERENCES 42

10. REPORT/SERIES NO.

11. CONTRACT NO. OE 3-10-072

12. PUBLICATION TITLE

13. EDITOR(S)

14. PUBLISHER U.S. Ofc. of Ed. Washington, D.C.

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15. ABSTRACT *(250 words max.)*

The history and evolution of the concept of intuition is traced through philosophical intuitionism and positivism to contemporary psychology. The theoretical and empirical psychological research relating to intuitive experience and intuitive behavior is also traced, and relations between intuitive problem solving and learning without awareness, signal detection, information processing, and social judgment are explored. Methods for the study of intuitive problem solving and previous data concerning individual differences and stability of individual differences in this propensity are reviewed.

Data are presented concerning the relationships between concurrent preferences appraised by the Strong Vocational Interest Blank and the Myers-Briggs Type Indicator and individual tendencies to solve problems accurately or inaccurately on large or small amounts of information. Interview studies are reported which compare the behavior and experience of individuals who show large increases in intuitive thinking with those who show large decreases. Interview data with extreme performers are reported concerning their thinking processes, and questionnaire study is presented appraising the post-college experience of individuals who showed various approaches to an intuitive problem solving task while in college.

Relationships between the present findings and earlier findings are discussed and several lines of further research are suggested.

16. RETRIEVAL TERMS *(Continue on reverse)*

Intuition, Cognition,	Intuitive Problem Solving Cognition and Personality		

17. IDENTIFIERS

Figure 3. ERIC Document Resume